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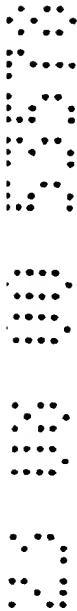
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Abstract

AN ELECTRONIC STORAGE CARD EXPANSION DEVICE

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A smart card (20) is disclosed having compressed indicia (21-26) which are able to be displayed on the touch sensitive screen (8) of a smart card reader (1). The component parts (210, 211....) of the expanded indicia are of sufficient size to each constitute a separately operable indicium. The number of operable indicia carried by the smart card
10 (20) is therefore increased.



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COMPLETE SPECIFICATION

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ORIGINAL

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The following statement is a full description of this invention, including the best method of performing it known to me/us:-

112 *Regulation*

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AN ELECTRONIC STORAGE CARD EXPANSION DEVICE

Technical Field of the Invention

The present invention relates generally to electronic storage cards known as smart cards and, in particular, to a device which enables the capabilities of such smart card to be expanded.

Background Art

Over recent years electronic storage cards have increased their market penetration and are increasingly finding public and commercial acceptance. The cards are approximately the same size as conventional credit cards (85x50 mm or 3.5x2 inches approximately) and contain an embedded semi-conductor memory which is able to be accessed by other electronic equipment through the placing of the smart card into a smart card reader. A particular application for smart cards is as an interface which provides a user interface between the user and some particular end application such as electronic banking, operation and control of electrical appliances, etc.

In some implementations, the front surface of the card is provided with indicia which relate to the contents of the electronic memory of the card. When the card is inserted into the card reader, the indicia are able to be actuated by the user to initiate electronic actions. Such may be facilitated by the use of either a transparent touch screen under which the card is placed, or the use of capacitive sensors located below the card. In either case, the front surface of the card effectively becomes a keyboard which is operated by the user.

Such an arrangement is convenient for some applications of smart cards since the on-board memory of the smart card was of moderate size and the number of functions and possible steps associated with the end use application of the smart card were also limited. In such cases the use of the front surface of the smart card as a keyboard was not a

limiting factor. However, with increasing complexity of smart cards and the amount of data, for example, stored within a smart card has increased. As a consequence, the number of categories of keys required to access the data and use the data properly has also increased. There is often insufficient space on the front surface of the smart card to 5 provide room for enough indicia to correctly indicate the different categories of data.

There is insufficient space also for the indicia to be a reasonable size to be able to be pressed or otherwise actuated by the tip of the finger of a user without the danger of pressing an incorrect indicium, or possibly two indicia simultaneously.

It is an object of the present invention to substantially overcome, or at least 10 ameliorate, one or more of the above mentioned disadvantages of existing arrangements.

Summary of the Invention

According to a first aspect of the present invention, there is disclosed a expansion device comprising:

receiving means for receiving an electronic storage card, said electronic storage 15 card having compressed indicia on a surface thereof;

first sensing means for sensing a user interaction of one of said compressed indicia by means of a touch sensitive transparent membrane extending over said expansion device;

display means for displaying an expanded version of said one indicia on a 20 display device on the basis of said user interaction, said expanded version of said one indicia is stored in said electronic storage card.

According to a second aspect of the present invention, there is disclosed A method comprising the steps of:

receiving an electronic storage card by a card reader, the electronic storage card having compressed indicia on surface;



sensing a user interaction of one of said compressed indicia by a touch sensitive transparent membrane extending over said card reader;

5 displaying an expanded version of said one indicia on a display device on the basis of said user interaction, said expanded version of said indicia is stored in said electronic storage card.

According to a third aspect of the present invention, there is disclosed an electronic storage card containing an electronic storage means in which data and/or software functions are stored, and having at least one compressed indicium formed on one surface of said card and electronically associated with said stored data and/or software 10 functions, wherein each said compressed indicia comprises an array of micro-images relating to compressed images stored in said electronic storage means.

Brief Description of the Drawings

Embodiments of the present invention will now be described with reference to the drawings, in which:



Fig. 1 is a front perspective view of the expansion device of the preferred embodiment pictured in the foreground whilst in the background is a personal computer or other electrical appliance with which the smart card is intended to cooperate;

5 Fig. 2 is a front view of a smart card for use in accessing a library of still photographs;

Fig. 3 is a screen display resulting from the operation of the smart card of Fig. 2;

Fig. 4 is a schematic block diagram of general purpose computer able to cooperate with the expansion device of the preferred embodiment; and

Fig 5 is a flowchart depicting use of the expansion device.

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Detailed Description including Best Mode

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Fig. 1 shows an expansion device 1 having a generally rectangular housing 2 which has a surface area approximately equivalent to one half of a conventional A4 sheet of paper and a relatively slim depth which enables it to be conveniently held in one hand (typically the user's left hand holds the left hand edge of the housing 2). Located at the right hand side of the housing 2 is a slot 3 leading into a bay 4 which constitutes a smart card reader. Also located within the housing 2 immediately above the bay 4 is a printed circuit board 5 containing integrated circuits 6. The device is powered by batteries (not illustrated) in a conventional fashion.

20

The remainder of the upper surface of the expansion device 1 is occupied by a screen 8 or other display device which can conveniently be formed from liquid crystal devices or other similar technologies. Extending over the screen 8 and the smart card bay 4 is a transparent touch sensitive membrane 9.

25

The expansion device 1 cooperates with another electrical appliance 11 which in Fig. 1 constitutes a substantially conventional computer system having a visual display unit 12 and a keyboard 13. The expansion device 1 and electrical appliance 11 each

contain a transceiver circuit (not illustrated but conventional) and are able to communicate with each other via antennae 14. Alternatively, the communication between the expansion device 1 and the electrical appliance 11 can be in the form of infra-red transmission via an infra-red transducer 15 illustrated on the electrical appliance 11, or by 5 a conventional cable connection 16 indicated by broken lines in Fig. 1. The conventional transceiver circuits or cable enable data and commands to be transferred backwards and forwards between the expansion device 1 and the electrical appliance 11. The bandwidth of such communications is rapidly increasing and the expense of the transceiver circuits is rapidly decreasing.

10 As illustrated in Fig. 1, a smart card 20 having compressed indicia 21-26 (to be described hereafter) is able to be inserted via the slot 3 into the bay 4. In this position the electronic memory (not illustrated) included within the smart card 20 is in electrical communication with the integrated circuits 6. Touching the membrane 9 above one of the compressed indicia 21-26 results in the reading of writing or data from the smart card 20 15 to the integrated circuits 6 and hence via the transceiver to the electrical appliance 11, for example for display of information contained within the smart card 20 on the visual display unit 12. Since the personal computer 11 can be connected via a modem or similar to the Internet, information can be sent from the smart card 20 to, or be loaded into the smart card 20 from, any remote location.

20 The expansion device 1 is also provided with several control switches such as on/off switch 17, card eject switch 18 and a project button 19. These switches can be provided either on the side of the housing 2 as illustrated in Fig. 1, or be located above the printed circuit board 5. The on/off switch 17 functions to turn the power of the expansion device 1 on or off. The card eject switch 18 when pressed ejects any smart card 20 which

is in the bay 4. The project button 19 when momentarily pressed projects the information displayed on the screen 8 onto the visual display unit 12.

Turning now to Fig. 2, the smart card 20 is illustrated in more detail. A user's collection of 72 photographs taken on vacation in 1985 have been digitised and stored in the memory of the computer 11. For each photographic image a "thumbnail" image is prepared. For each "thumbnail" image a still further reduction or "micro-image" is prepared. Twelve micro-images are arranged in a rectangular block to form a single compressed icon 21. Another twelve micro-images are arranged in another rectangular block to form another compressed icon 22, and so on for the remaining compressed icons

10 23-26.

Within the memory of the smart card 20 is mapping data relating to each of the compressed icons 21-26. Also stored in the smart card 20 for each of the compressed icons 21-26 is the image data for the corresponding thumbnail images and the address of each full image in the memory of the computer 11.

15 Operation of the expansion device 1 may now be described with reference to the steps 50 of the flowchart of Fig. 5. The smart card 20 at step 51 is inserted into the slot 3 and at step 52 the touch screen 9 above. The card 20 is pressed at a location corresponding to one of the icons, say icon 21. Then, at step 53, the circuits 6 extract data from the card 20 corresponding compressed thumbnail images represented by the icon 21.
20 The circuits 6 expand the data and at step 54 the corresponding thumbnail images 210, 211, 212, etc are each displayed on the screen 8, as seen in Fig 3. This display thus constitutes an expanded icon. Typically the integrated circuits 6 can perform both compression and expansion functions.

The user is then able to inspect each of the thumbnail images of the expanded icon in turn and, from step 55, select one thumbnail image by pressing the touch screen 9

above the selected thumbnail image. As a result, the address of the corresponding full image in the computer 11 is retrieved from the memory of the smart card 20 and transmitted to the computer 11 in step 56. At step 57, the computer 11 uses the address to retrieve the full image corresponding to the selected thumbnail and the full image is then
5 displayed on the visual display unit 12. The user is then able to print a colour copy of the image on a printer 115 (Fig. 4), for example.

At step 58, if the user has no further desire to review any more images, the card 20 may be removed from the expansion device 1 at step 60. Alternatively, step 59 permits the user to make another selection from the expanded icon displayed on the
10 screen 8 of the expansion device 1 by returning to step 52, the user may select another compressed icon 22,23...26 and commence the viewing again.

The result of the above is that the small smart card 20 becomes an interface or key to the library of digitised photographs stored in the computer 11. The thumbnail images are the index to the full images and the compressed icons 21-26 are the index to
15 the thumbnail images. The micro-images provide only a general hint as to the content of the real images as they are too small to be individually inspected. However, a series of sea view micro-images would give the corresponding compressed icon a bluish appearance. Similarly, a series of jungle photos would result in the corresponding micro-
images being generally green and thus the corresponding compressed icon would have a
20 green tinge. Sunsets would be yellow/red, etc. In this way the user can ascertain information from the micro-images even though they cannot be easily viewed from the smart card 20 with the naked eye.

With this information and some experience, a user with a large library of photographs (say 720) stored in the computer 11 and all relating to his 1985 vacation, is
25 able to quickly move through the corresponding 10 smart cards in order to browse the

library. The library may also extend to images stored over a computer network, such as the Internet.

It will be apparent to those skilled in the art that the present invention is not restricted to still photographs. By making each of the thumbnail images a single representative frame of a video sequence, a large number of video sequences stored in the computer 11 can be quickly and easily accessed. For example, video clips of schoolboy sporting fixtures would be able to be identified from the thumbnail images because the different school team uniforms can be differentiated from the thumbnail images. This enables the different matches, and hence the corresponding video clips, to be quickly identified.

Furthermore, for persons with impaired vision, when the expanded icon of the still photographic library is displayed on the screen 8, momentarily pressing the project button 19 displays the expanded icon on the visual display unit 12 as well. This assists in the selection of the appropriate thumbnail image. For the video library, the project button 19 if held down after a thumbnail image has been selected, plays the corresponding video clip in slow motion on the visual display unit 12.

It will be apparent that the above described embodiments require substantial volumes of data to be transmitted by the antennae 14. In order to reduce the bandwidth requirement of this function, it is desirable to provide the expansion device 1 with an MPEG decoder, or similar, so as to reduce the amount of data which needs to be transmitted. If a lesser amount of data is only required to be transmitted, the expansion device 1 need not have any computational power and can be regarded as a "dumb terminal". In the latter case, the software application runs on the server or electrical appliance 11 whilst in the former case where the computing power is available within the

expansion device 1, then the software application is able to run within the expansion device 1 itself.

Because of its size and the ability to be held in the left hand whilst the right hand operates the touch sensitive membrane 9, the expansion device 1 may be likened to an
5 artist's palette with the "palette" screen 8 providing a convenient expansion area which greatly enhances the functionality of smart cards.

The electrical appliance 11 preferably takes the form of a general-purpose computer system 100, such as that shown in Fig. 4 wherein the above described processes are able to be implemented as software, such as an application program executing within
10 the computer system 100. In particular, the steps of the application programme are effected by instructions in the software that are carried out by the computer. The software may be divided into two separate parts; one part for carrying out the abovementioned methods; and another part to manage the user interface between the latter and the user.
The software may be stored in a computer readable medium, including the storage
15 devices described below, for example. The software is loaded into the computer from the computer readable medium, and then executed by the computer. A computer readable medium having such software or computer program recorded on it is a computer program product. The use of the computer program product in the computer preferably effects an advantageous apparatus for use in accordance with the embodiments of the invention.
20

The computer system 100 comprises a computer module 101, input devices such as the keyboard 13 and a mouse 103, output devices including a printer 115 and a display device 12. A Modulator-Demodulator (Modem) transceiver device 116 is used by the computer module 101 for communicating to and from a communications network 120, for example connectable via a telephone line 121 or other functional medium. The

modem 116 can be used to obtain access to the Internet, and other network systems, such as a Local Area Network (LAN) or a Wide Area Network (WAN).

The computer module 101 typically includes at least one processor unit 105, a memory unit 106, for example formed from semiconductor random access memory (RAM) and read only memory (ROM), input/output (I/O) interfaces including a video interface 107, and an I/O interface 113 for the keyboard 102 and mouse 103 and optionally a joystick (not illustrated), and an interface 108 for the modem 116. A storage device 109 is provided and typically includes a hard disk drive 110 and a floppy disk drive 111. A magnetic tape drive (not illustrated) may also be used. A CD-ROM drive 112 is typically provided as a non-volatile source of data. The components 105 to 113 of the computer module 101, typically communicate via an interconnected bus 104 and in a manner which results in a conventional mode of operation of the computer system 100 known to those in the relevant art. Examples of computers on which the embodiments can be practised include IBM-PC's and compatibles, Sun Sparcstations or alike computer systems evolved therefrom.

Typically, the application program of the preferred embodiment is resident on the hard disk drive 110 and read and controlled in its execution by the processor 105. Intermediate storage of the program and any data fetched from the network 120 may be accomplished using the semiconductor memory 106, possibly in concert with the hard disk drive 110. In some instances, the application program may be supplied to the user encoded on a CD-ROM or floppy disk and read via the corresponding drive 112 or 111, or alternatively may be read by the user from the network 120 via the modem device 116. Still further, the software can also be loaded into the computer system 100 from other computer readable medium including magnetic tape, a ROM or integrated circuit, a magneto-optical disk, a radio or infra-red transmission channel between the computer

module 101 and another device, a computer readable card such as a PCMCIA card, and the Internet and Intranets including e-mail transmissions and information recorded on Websites and the like. The foregoing is merely exemplary of relevant computer readable media. Other computer readable media may be practiced without departing from the
5 scope and spirit of the invention.

The above described method may alternatively be implemented in dedicated hardware such as one or more integrated circuits. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

10

Industrial Applicability

It is apparent from the above that the embodiments of the invention are applicable to the multi-media equipment and control arts.

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The foregoing describes only some embodiments of the present invention, and modifications and/or changes can be made thereto without departing from the scope and spirit of the invention, the embodiments being illustrative and not restrictive.

In the context of this specification, the word "comprising" means "including principally but not necessarily solely" or "having" or "including" and not "consisting only of". Variations of the word comprising, such as "comprise" and "comprises" have corresponding meanings.

The claims defining the invention are as follows:

1. A expansion device comprising:

receiving means for receiving an electronic storage card, said electronic storage
5 card having compressed indicia on a surface thereof;
first sensing means for sensing a user interaction of one of said compressed
indicia by means of a touch sensitive transparent membrane extending over said
expansion device;
display means for displaying an expanded version of said one indicia on a
10 display device on the basis of said user interaction, said expanded version of said one
indicia is stored in said electronic storage card.

2. The expansion device as claimed in claim 1, further comprising:

second sensing means for sensing another user interaction of one of said
15 expanded version of said indicia by means of said touch sensitive transparent membrane;
execution means for carrying out a function on the basis of said another user
interaction.

3. The expansion device as claimed in claim 2, wherein the function is displaying a
20 image corresponding to said expanded version of said one indicia.

4. The expansion device as claimed in claim 2, wherein the compressed indicia
represents a frame of a video sequence, and the function is displaying video image.

5. The expansion device as claimed in claim 3, further comprising:



communication means for communicating with a remote server, the remote server including a visual display unit;
wherein the image is displayed on the visual display unit.

5 6. The expansion device as claimed in any one of claims 1 to 5, wherein an area of said display means exceeds an area of one surface of said electronic storage card.

7. The expansion device as claimed in any one of claims 1 to 6, further comprising a project means which is operable to display the contents of said storage card.

10
8. The expansion device as claimed in any one of claims 1 to 7, wherein said expansion device is sized to be held by one hand of a user, said receiving means is located to the right of said display means to thereby permit said expansion device to be held in the left hand whilst the touch sensitive membrane is touched by one or more fingers of the
15 right hand.

9. A method comprising the steps of:
receiving an electronic storage card by a card reader, the electronic storage card having compressed indicia on surface;

20 sensing a user interaction of one of said compressed indicia by a touch sensitive transparent membrane extending over said card reader;
displaying an expanded version of said one indicia on a display device on the basis of said user interaction, said expanded version of said indicia is stored in said electronic storage card.



10. The method as claimed in claim 9, further comprising the step of:
sensing another user interaction of one of said expanded version of said indicia;
and
carrying out a function on the basis of said another user interaction.

5

11. An electronic storage card containing an electronic storage means in which data
and/or software functions are stored, and having at least one compressed indicium formed
on one surface of said card and electronically associated with said stored data and/or
software functions, wherein each said compressed indicia comprises an array of micro-
10 images relating to compressed images stored in said electronic storage means.

12. The card as claimed in claim 11, wherein each said compressed image is
expandable to an array of thumbnail images, each said micro-image being a compressed
thumbnail image.

15

13. The card as claimed in claim 12, wherein each said thumbnail image is a
compressed image.

14. The card as claimed in claim 13, wherein each image is a still image.

20

15. The card as claimed in claim 13, wherein each image is a representative frame
from a corresponding video sequence.

16. An expansion device substantially as described herein with reference to the
drawings.



17. An electronic storage card expansion system substantially as described herein with reference to the drawings.

5

DATED this SIXTH Day of NOVEMBER 2002

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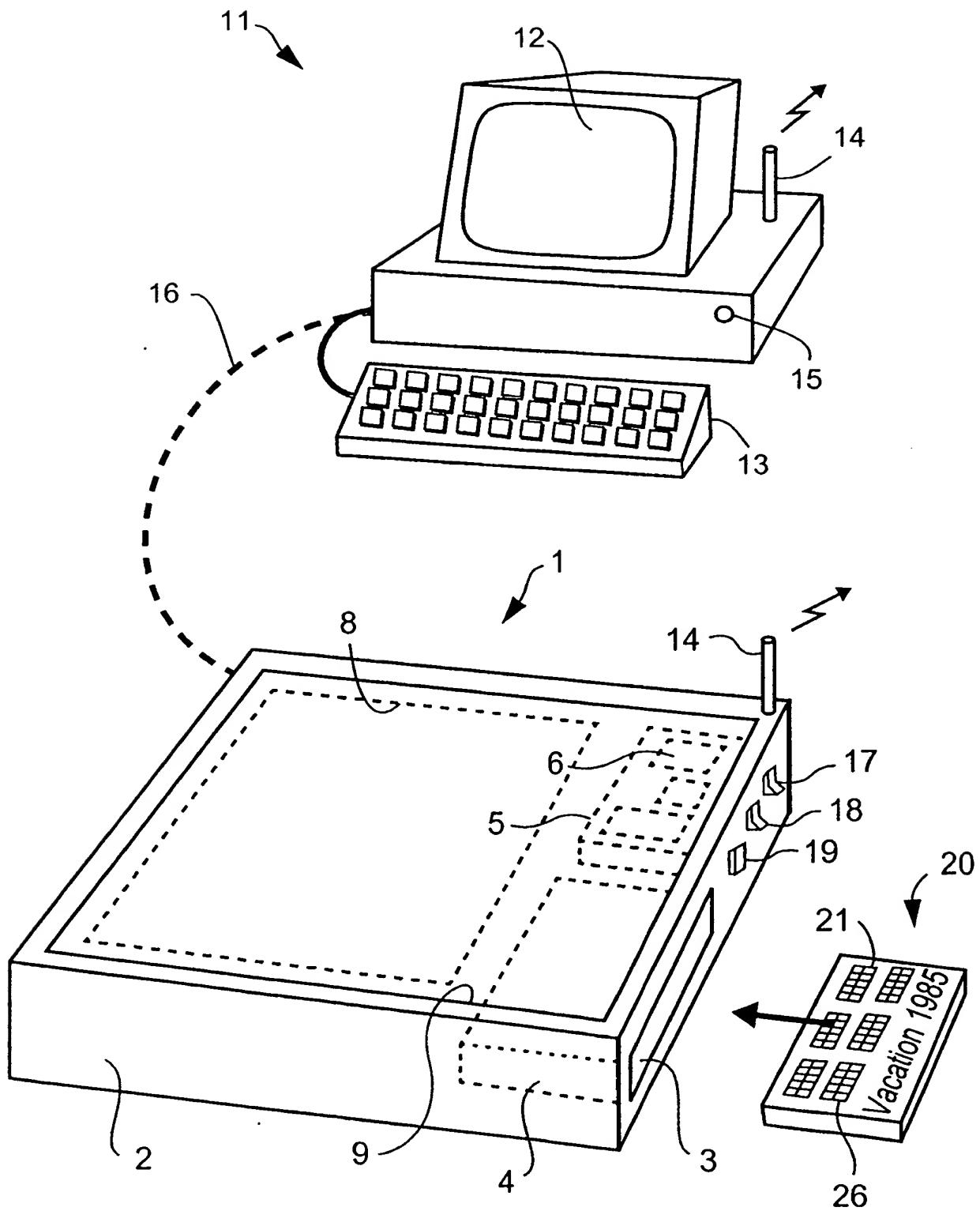
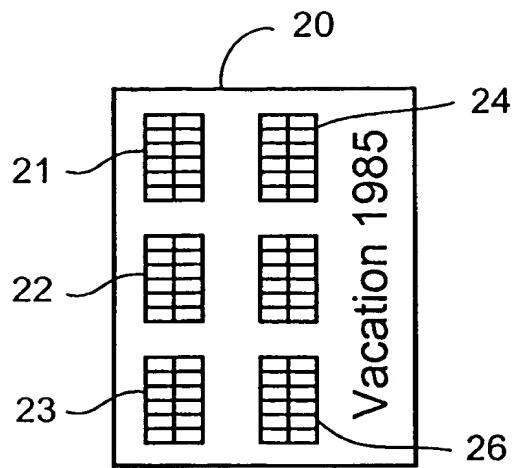
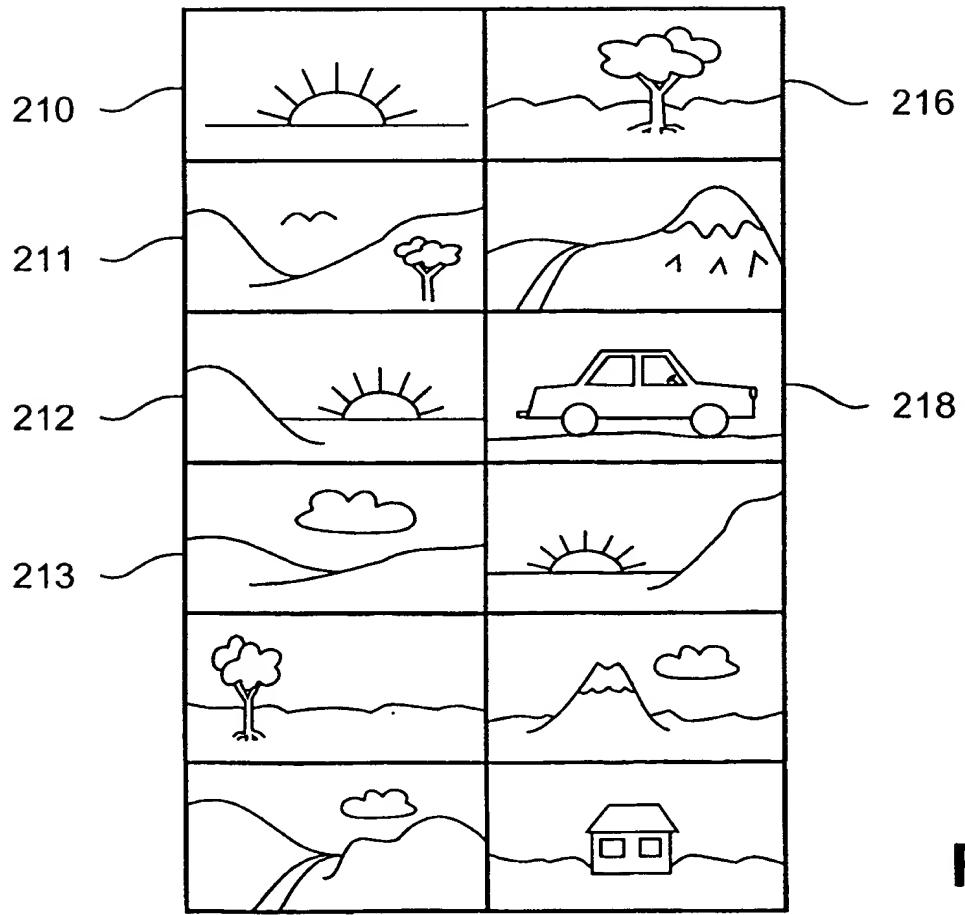
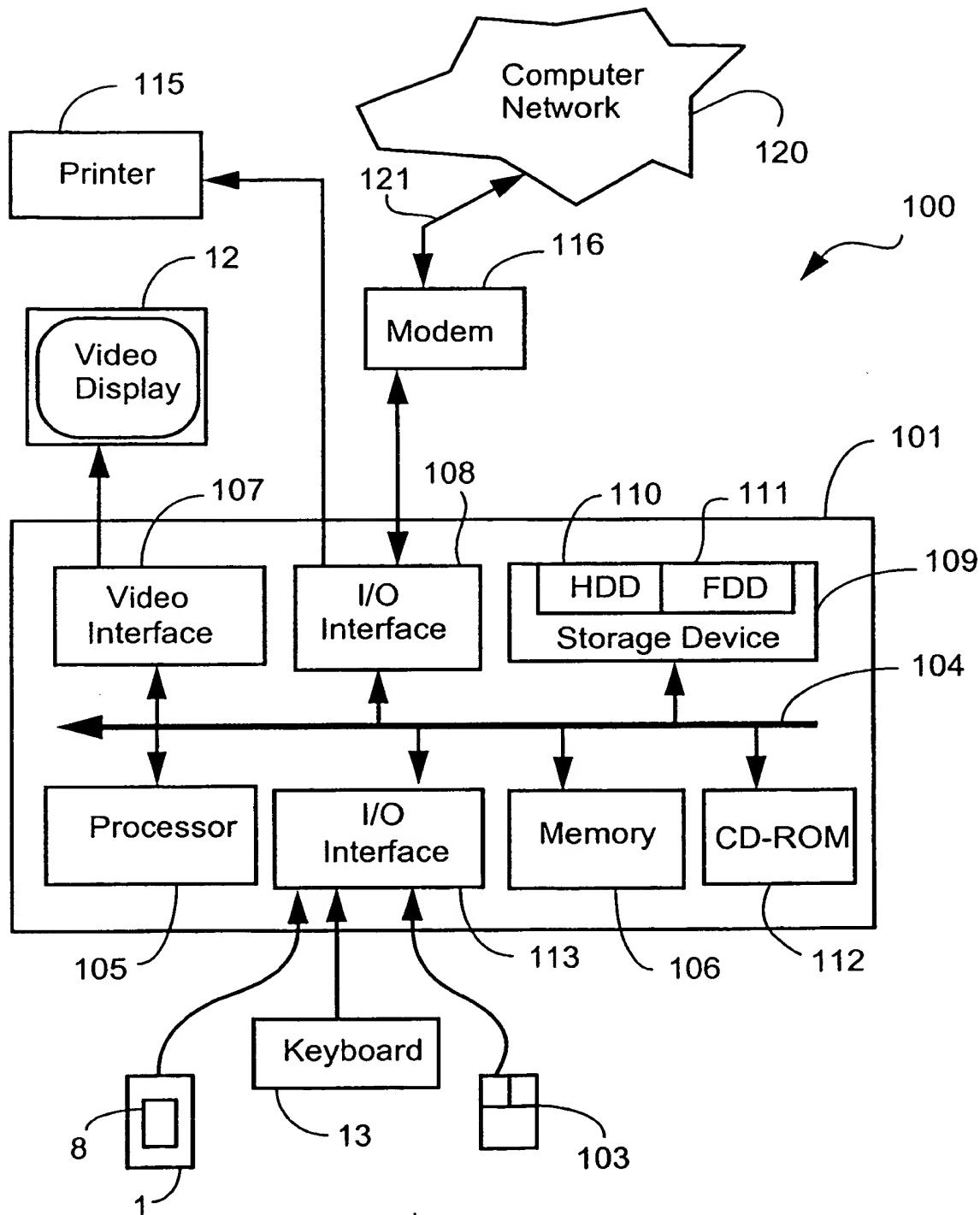


Fig. 1

**Fig. 2****Fig. 3**

**Fig. 4**

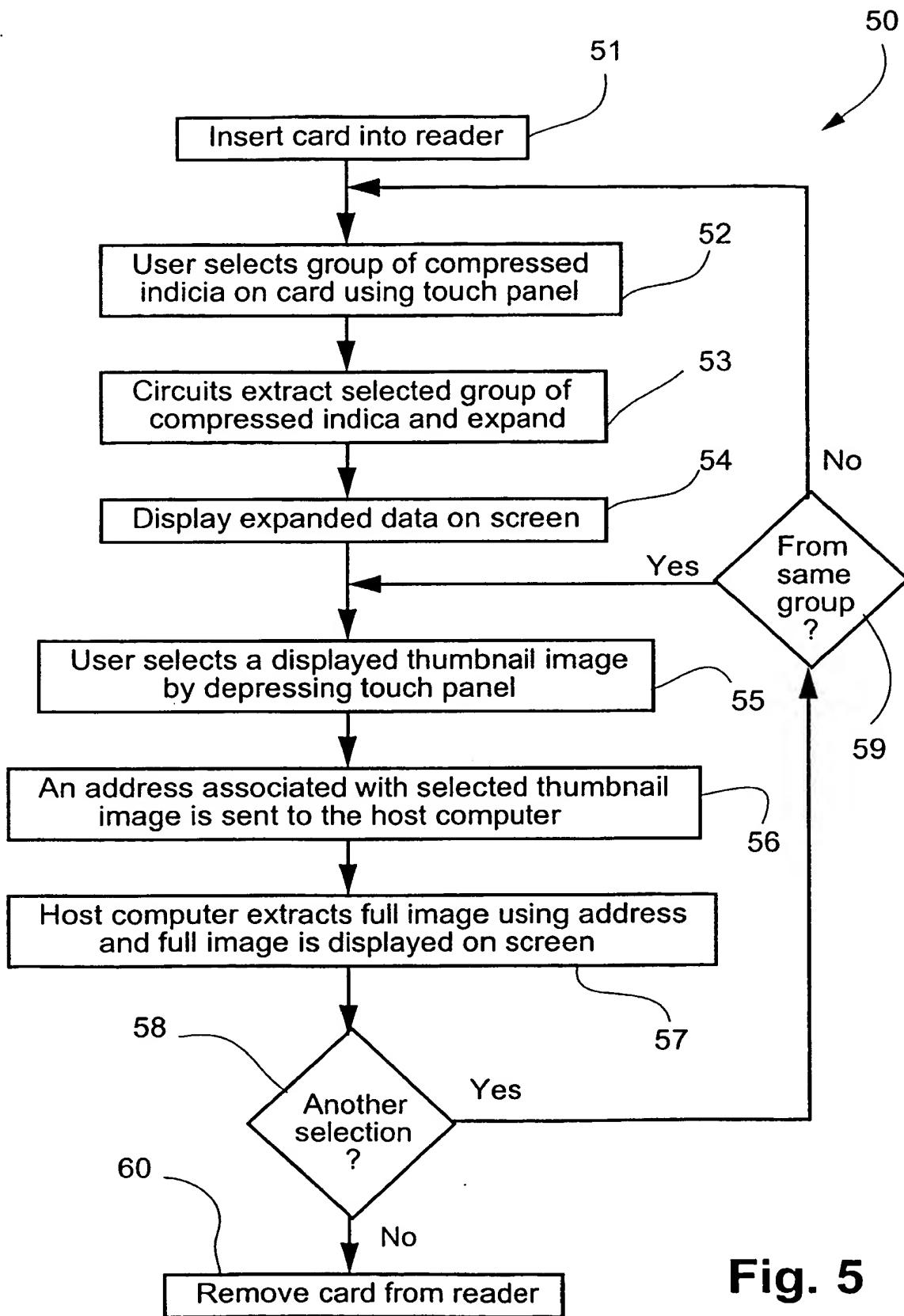


Fig. 5